



**RoHS compliant**  
**1550 nm Single-mode Transceiver**  
**Small Form Pluggable (SFP), 3.3V**  
**1.0625Gbd Fiber Channel/1.25 Gigabit Ethernet**

### Description



- Up to 1.25Gbps data rate
- DFB laser transmitter and APD photo-detector
- Duplex LC receptacle optical interface compliant
- Single +3.3V power supply
- Hot-pluggable
- Metal enclosure, for lower EMI
- International Class1 laser safety certified
- Operating temperature range:
  - Commercial: 0°C~+70°C
  - Industrial: -40°C~+85°C
- RoHS Compliant
- DDML function available with internally calibrated mode
- Up to 200km on 9/125µm SMF

### Applications

- Gigabit Ethernet
- Compliant with SFF-8472 v11.0
- Switched Backplane Applications
- Router/Server Interface

### Applications

- Point-to-Point networking
- Other Optical Links

### Ordering Information

PART NUMBER	TX/RX	INPUT/OUTPUT	SIGNAL DETECT	TEMPERATURE	LD Type	Distance
CL-SFP-EZX_200 DD	1470	AC/AC	TTL	0°C to 70 °C	DFB	200km
CL-SFP-EZX_200 DDi	1470	AC/AC	TTL	-40°C to 85 °C	DFB	200km



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## Specification

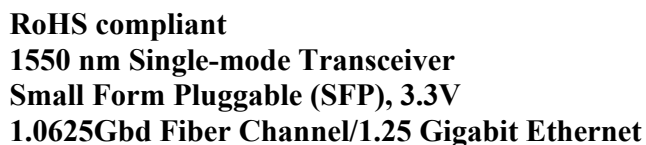
Absolute Maximum Ratings				
Parameter	Symbol	Min	Max	Unit
Storage temperature	TS	-40	85	°C
Power Supply Voltage	Vcc	-0.5	+4	V
Relative Humidity	RH	5	95	%
Signal Input Voltage		-0.3	Vcc+0.3	V
Receiver Damage Threshold		+7		dBm

Recommended Operating Conditions					
Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature (Commercial)	Tc	0		70	°C
Operating Case Temperature (Industrial)		-40		85	
Power Supply Voltage	Vcc	3.13	3.3	3.47	V
Ambient Humidity	HA	5		70	%
Supply Current	Icc			300	mA
Data Rate		-	1.25	-	Gbps
Fiber Length 9/125µm core SMF		-	200	-	km



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Electrical Characteristics						
Parameter	Symbol	Min	Typical	Max	Unit	Notes
Total Supply Current	ICC			A(TX)	mA	A (TX) + B (RX) = 300mA
Transmitter Disable Input-High	VDISH	2		Vcc+0.3	mV	
Transmitter Disable Input-Low	VDISL	0		0.8	V	
Transmitter Fault Input-High	VDISL	2		Vcc+0.3	V	
Transmitter Fault Input-Low	VTxFH	0		0.8	V	
Total Supply Current				B(RX)	mA	A (TX) + B (RX) = 300mA
Loss of Signal (LOS)	Voh	2		Vcc+0.3	V	
	Vol	0		0.8	V	
Optical transmitter Characteristics						
Parameter	Symbol	Min	Typical	Max	Unit	Notes
Average Output Power	Pout	1		6	dBm	1
Operating Wavelength Range	$\lambda_c$	1530	1550	1570	nm	
Spectrum Bandwidth(RMS)	$\sigma$			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	9			dB	2
Differential Line Input Impedance	RIN	90	100	110	Ohm	
Jitter P-P	tj			0.1	UI	
Optical Tx Output disable	Pdis			-45	dBm	
Output Eye Diagram	Complies with IEEE802.3 z (class 1 laser safety)					
Optical receiver Characteristics						
Parameter	Symbol	Min	Typical	Max	Unit	Notes



**Notes:**

- 1) The supply current is SFP module's working current.
- 2) For the measurements, the device was driven with 1.25Gbps data pattern with  $2^7-1$  PRBS payload.
- 3) Optical transition time is the time interval required for the rising or falling edge of an optical pulse to transition between the 20% and 80% amplitudes relative to the logical 1 and 0 levels
- 4) Measured with a PRBS  $2^7-1$  test pattern, @1.25Gbps, 1550nm, ER=9dB, BER< $10^{-12}$
- 5) The LOS Hysteresis minimizes 'chatter' on the output line. In principle, Hysteresis alone does not guarantee chatter-free operation.

The diagram illustrates the internal circuitry of an SFP module. It shows the following components and their interconnections:

- Protocol IC:**
  - Inputs: `Protocol Vcc`, `Tx_Disable`, `Tx_Fault`, `Rx_LOS`.
  - Outputs: `Tx_Disable`, `Tx_Fault`, `Rx_LOS`.
- SerDes IC:**
  - Inputs: `Tx_Disable`, `Tx_Fault`, `Rx_LOS`.
  - Outputs: `Tx_Disable`, `Tx_Fault`, `Rx_LOS`.
- FLD/PAL:**
  - Inputs: `RES1`, `RES1`, `RES1`.
  - Outputs: `Mod_def 2`, `Mod_def 1`, `Mod_def 0`.
- External Components:**
  - Laser Driver:** Receives `TD+` and `TD-` signals. It is powered by `VccR` and `VeeT`. It drives the **Laser Diode**.
  - Amplifier:** Receives `RD+` and `RD-` signals. It is powered by `VccR` and `VeeR`. It drives the **Photo Diode**.
  - EEPROM:** Receives `Mod_def 2`, `Mod_def 1`, and `Mod_def 0` signals.

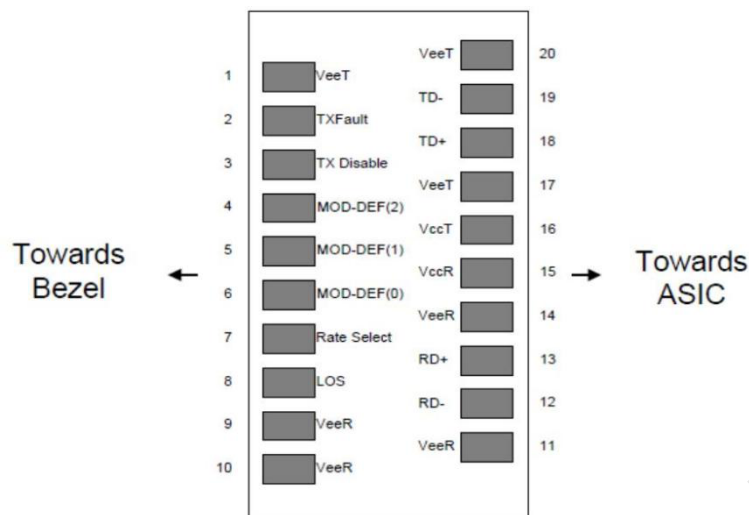
**Legend:**

- `RES1 = 4.7K to 10K Ohms`
- `* Depends on SerDes IC used`



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## Pin Descriptions



Pin	Symbol	Function/Description	Ref.
1	VeeT	Transmitter Ground	1
2	TX Fault	Transmitter Fault Indication	3
3	TX Disable	Transmitter Disable-Module disables on high or open	3
4	MOD-DEF2	Module Definition 2-Two wire serial ID interface	3
5	MOD-DEF1	Module Definition 1-Two wire serial ID interface	3
6	MOD-DEF0	Module Definition 0-Two wire serial ID interface	3
7	Rate Select	Not Connected	3
8	LOS	Loss of Signal	3
9	VeeR	Receiver Ground	1
10	VeeR	Receiver Ground	1
11	VeeR	Receiver Ground	1
12	RD-	Inverse Received Data out	3
13	RD+	Received Data out	3
14	VeeR	Receiver Ground	1



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15	VccR	Receiver Power — +3.3V±5%	2
16	VccT	Transmitter Power — +3.3 V±5%	2
17	VeeT	Transmitter Ground	1
18	TD+	Transmitter Data In	3
19	TD-	Inverse Transmitter Data In	3
20	VeeT	Transmitter Ground	1

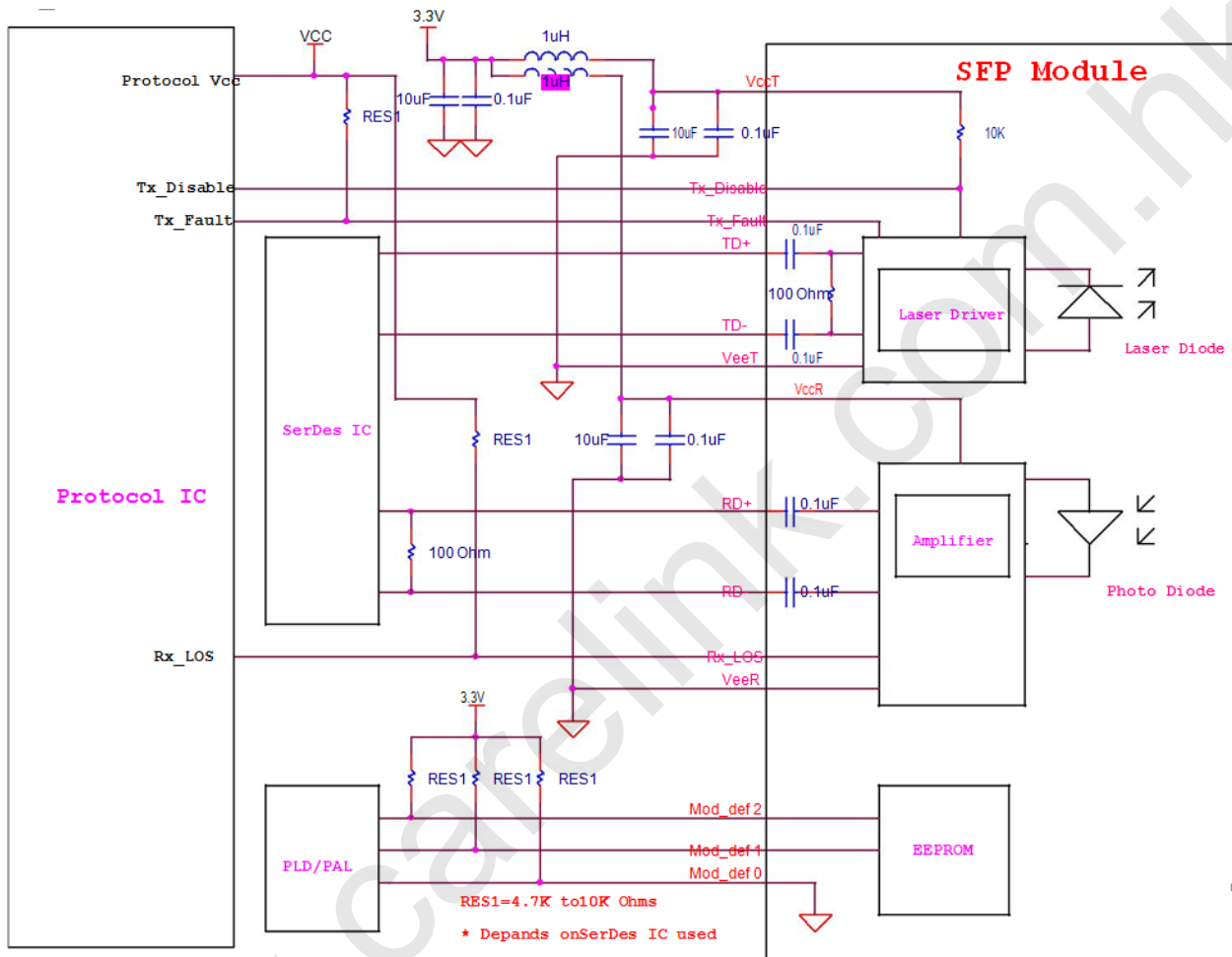
**Notes:**

- 1) TX Fault is open collector/drain output which should be pulled up externally with a 4.7K – 10KΩ resistor on the host board to supply <VccT+0.3V or VccR+0.3V. When high, this output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to <0.8V.
- 2) TX Disable input is used to shut down the laser output per the state table below. It is pulled up within the module with a 4.7K – 10K Resistor.  
Low (0 – 0.8V): Transmitter on ;  
  
Between (0.8V and 2V): Undefined High ;  
  
(2.0 – VccT): Transmitter Disabled ;  
  
Open: Transmitter Disabled.
- 3) Mod-Def 0, 1, 2. These are the module definition pins. They should be pulled up with a 4.7 – 10K Resistor on the host board to supply less than VccT+0.3V or VccR+0.3V.  
Mod-Def 0 is grounded by the module to indicate that the module is present.  
  
Mod-Def 1 is clock line of two wire serial interface for optional serial ID.  
  
Mod-Def 2 is data line of two wire serial interface for optional serial ID.
- 4) LOS (Loss of signal) is an open collector/drain output which should be pulled up externally with a 4.7 – 10K resistor on the host board to supply <VccT+0.3V or VccR+0.3V. When high, this output indicates the received optical power is below the worst case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to <0.8V.
- 5) RD-/+: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω differential at the user SERDES. The AC coupling is done inside the module and thus not required on the host board.
- 6) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V±5% at the SFP connector pin. The in-rush current will typically be no more than 30mA above steady state supply current after 500ns.
- 7) TD-/+: These are the differential transmitter inputs. They are AC coupled differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on host board.



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## Typical application Circuit

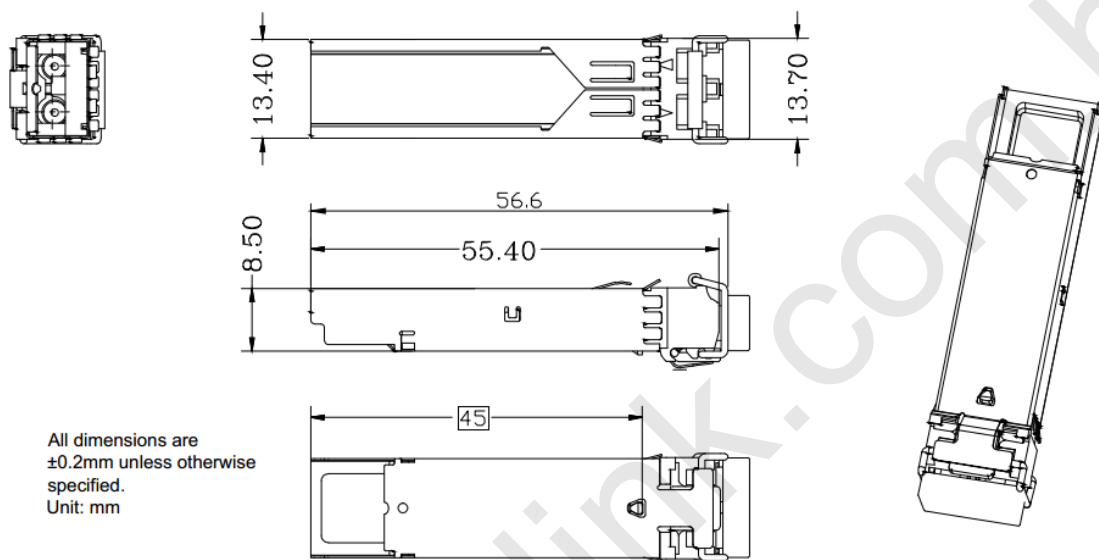




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## Package Outline

Dimensions are in millimeters. All dimensions are  $\pm 0.2\text{mm}$  unless otherwise specified. (Unit: mm)



## Regulatory Compliance

Feature	Test	Method
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1(>1000V for SFI pins, >2000V for other pins.)
Electrostatic Discharge (ESD) Immunity	IEC61000-4-2	Class 2(>4.0kV)
Electromagnetic Interference (EMI)	CISPR22 ITE Class B FCC Class B CENELEC EN55022 VCCI Class 1	Comply with standard
Immunity	IEC61000-4-3	Comply with standard
Eye Safety	FDA 21CFR 1040.10 and	Compatible with Class I laser





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